Volume Determinations

For Second-Growth Slash and Longleaf Pine

In Northeast Florida

by

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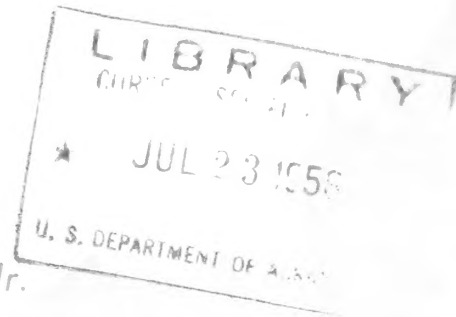
VOLUME DETERMINATIONS FOR SECOND-GROWTH
SLASH AND LONGLEAF PINE IN NORTHEAST FLORIDA

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Faulty estimates of merchantable height undoubtedly have contributed more to erroneous estimates of volume and growth than any other single factor. Such errors, especially when repeated in periodic inventories, undermine the value of volume and growth estimates in research and in practice. These errors can be reduced by the use of volume tables based on total height. Toward this end, a study was made of the relationship of the merchantable volume of longleaf and slash pine to total height and other tree characteristics.

The characteristics used in this study, in addition to total height, were diameter breast high (d.b.h.), form, and crown ratio. Girard's form class was used to express the form of saw-log trees, and form quotient[1] to express the form of pulpwood trees.

Measurements were taken on 333 felled trees within a 40-mile radius of Olustee, Florida. The trees were reasonably straight, single-stemmed, and showed no evidence of injury or wood chipping for naval stores. Merchantable sawtimber top was taken at 8 inches d.o.b. unless excessive limbiness prevented full utilization. Merchantable pulpwood top was set at 4 inches d.o.b. Only unusual crookedness or severe limbiness restricted utilization up to that point. The measurements were recorded on Forest Service Form 558a, and the volumes for each tree computed therefrom.

A regression analysis of the volume data was made to determine a suitable equation form, using the variables D^2, H, F, and CR,[2] and their appropriate products in the light of their effect upon or significant contribution to the precision of estimate in both cubic and board volume.

CUBIC VOLUMES

The most significant variable in the complete regression of characteristics affecting the cubic-foot volume of slash and longleaf pine was the product D^2HF. After the effect of this combined variable was removed, however, other variables were found that still contributed significantly to the precision of the estimate, but to a much lesser degree.

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[1] Form quotient as used in this study is the ratio of d.i.b. at the midpoint (between breast height and merchantable height) to d.b.h.

[2] Where D is diameter at breast height in inches, H is total height of tree in feet, F is form class or form quotient in percent, and CR is crown ratio in percent.

Slash Pine

The variables contributing to the cubic-foot volume estimates of slash pine pulpwood (5.0-12.9 inches d.b.h.), in order of their importance, were D^2HF**, D^2H**, D^2HCR*, and D^2*.[3] The coefficient of determination for this set of variables was 99.5 percent, and the regression equation becomes:

$$Vol. (cubic feet) = .00003(D^2HF) + .00057(D^2H) - .000005(D^2HCR) + .02457(D^2) - 1.704.$$

Accurate measurements of form and crown ratio, however, are difficult to obtain, and often costly. Since the significant variables consisted primarily of D^2 and H, a second regression was computed using only one independent variable, D^2H. The coefficient of determination for this single variable was 99.1 percent, and the short regression equation becomes:

$$Vol. (cubic feet) = .002853D^2H - .976.$$

A slash pine volume table expressed in cubic feet and based on this equation may be found in the Appendix.

Longleaf Pine

D^2HF**, $F**$, and D^2HCR*, in that order, contributed significantly to the determination of cubic-foot volume estimates for longleaf pine pulpwood. The coefficient of determination was calculated as 99.3 percent, and the regression equation becomes:

$$Vol. (cubic feet) = .00004345(D^2HF) - .052(F) - .00000313(D^2HCR) + 1.219.$$

Since both D^2 and H are already included in two of the three significant variables, and since a combined D^2H variable was used so successfully for slash pine determinations, this single independent variable was used again. The coefficient of determination was 98.5 percent, and the short regression equation becomes:

$$Vol. (cubic feet) = .00287D^2H - .956.$$

A longleaf pine volume table expressed in cubic feet and based on this equation may be found in the Appendix. Since the short equations for longleaf and slash pine were so much alike, a combined regression using the single variable D^2H for both species was run. The coefficient of determination was 98.8 percent, and the combined short regression equation becomes:

$$Vol. (cubic feet) = .00286D^2H - .956.$$

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[3] * - Significant at the 5 percent level.
   ** - Significant at the 1 percent level.

The table based on this equation is also found in the Appendix.

Cubic-foot volumes may occasionally be needed for sawtimber-size trees. The most significant variable of those tested was D^2HF, but the co-efficient of determination was reduced only 1 percent by using D^2H as the single independent variable in the regression. Cubic-foot volumes for saw-log-size slash and longleaf pine may also be found in the Appendix.

BOARD VOLUMES

D^2HF was also the most significant variable in the complete regression of characteristics affecting the board-foot volume content of slash and long-leaf pine, measured either by the Scribner or International $\frac{1}{4}$-inch Rule.

Slash Pine

The variables contributing to the board-foot volume estimates of slash pine sawtimber (+9.0 inches d.b.h.[4]), Scribner Rule, in order of their im-portance were D^2HF**, D^2H**, and $HF**$. Their coefficient of determination was 97.8 percent, and the regression equation becomes:

$$\text{Vol. (board-feet, Scribner)} = .0003131(D^2HF) - .01005(D^2H) - .0077(HF) - 12.05.$$

Using board-foot volume estimates from the International $\frac{1}{4}$-inch Rule, D^2HF**, $H**$, and D^2H* were significant contributors, in that order. Their coefficient of determination was 98.1 percent, and the regression equation becomes:

$$\text{Vol. (board-feet, Int. } \tfrac{1}{4}\text{-inch)} = .0002586(D^2HF) - 1.1(H) - .00392(D^2H) + 4.702.$$

The significance of the combined variable D^2H was evident again. The coefficient of determination for this single variable was 94.2 percent for Scribner volumes and 95.7 percent for International $\frac{1}{4}$-inch volumes. The short regression equations are:

$$\text{Vol. (board-feet, Scribner)} = .01343D^2H - 45.45.$$

$$\text{Vol. (board-feet, Int. } \tfrac{1}{4}\text{-inch)} = .01495D^2H - 60.25.$$

A local volume table for slash pine sawtimber based on these equations is in the Appendix.

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[4] Sawtimber trees must have at least one 16-foot log to an 8-inch top outside bark.

Longleaf Pine

The significant characteristics contributing to volume estimates of longleaf trees are almost identical to those for slash pine. For Scribner volumes, D^2HF^{**}, H^{**}, F^*, and D^2H^* in that order contributed significantly. The coefficient of determination for these variables was 96.2 percent, and the regression equation becomes:

$$\text{Vol. (board-feet, Scribner)} = -.00006(D^2HF) - .8899(H) + 3.1612(F) + .019829(D^2H) - 243.662$$

For International $\frac{1}{4}$-inch volumes, D^2HF^{**}, and H^{**} were the significant variables of those tested. Their coefficient of determination was 96.4 percent, with a regression equation as follows:

$$\text{Vol. (board-feet, Int. } \tfrac{1}{4}\text{-inch)} = .0002(D^2HF) - 1.053(H) + 7.320.$$

Using the single variable D^2H in a regression as before, the coefficient of determination for Scribner volumes was 92.3 percent and that for International $\frac{1}{4}$-inch volumes 93.4 percent. The short regression equations are:

$$\text{Vol. (board-feet, Scribner)} = .01485D^2H - 48.20$$

$$\text{Vol. (board-feet, Int. } \tfrac{1}{4}\text{-inch)} = .01662D^2H - 63.97.$$

A local volume table for longleaf pine sawtimber based on these equations is in the Appendix.

TOPWOOD

That portion of the saw-log tree above an 8-inch top to an upper merchantability of 4 inches, outside bark, is considered topwood. In this study, the entire cubic-foot content of this portion of the tree was considered merchantable for pulpwood or cordwood, without regard to length.

Using the variables D^2 and H, and their combined effect, a regression analysis indicated $\frac{H}{D^2}$ as the only significant variable. This relationship was true for both longleaf and slash pine topwood. The coefficient of determination for longleaf was 71.0 percent and for slash 68.8 percent. The regression equations were:

Longleaf

$$\text{Topwood volume (cubic feet)} = 11.08 \left(\frac{H}{D^2}\right) + .2257$$

Slash

$$\text{Topwood volume (cubic feet)} = 13.06 \left(\frac{H}{D^2}\right) - .1268$$

Local topwood tables may be found in the Appendix. A combined table for both longleaf and slash pine is also presented for use in topwood determinations in mixed stands where species are not designated. An estimate of topwood volumes per MBM of sawtimber, by average stand diameters, may also be found in the Appendix.

This method of determining topwood is applicable only in second-growth stands where an 8-inch merchantable sawtimber top is strictly adhered to. If board-foot volume is obtained from above an 8-inch top or if other volume tables are used in estimating the board-foot content, these ratios of topwood to sawtimber volume will not apply.

In addition, old-growth longleaf pines are usually so flattopped that they contain no merchantable topwood, and no topwood determinations are recommended for stands of this nature. Longleaf pine above 16 inches d.b.h. and slash pine above 18 inches d.b.h. have such small quantities of merchantable topwood that determinations are seldom advisable.

CONCLUSIONS

Although the combined variable D^2HF proved to be most significant in the determination of cubic- and board-foot volumes for slash and longleaf pine in northeast Florida, the use of the single variable D^2H did not reduce the coefficient of determination to any appreciable degree.

Diameter and total height measurements are both easy to obtain. Diameter may be measured or estimated, depending on the number of trees involved and the accuracy desired. Total height can be measured with an Abney level or hypsometer. A sample of total height usually suffices, with just enough samples to construct a reliable height-diameter curve.

The effect of form will usually be reflected in the height-diameter relationship, but in certain instances, extremes in form may require adjustments in volume estimates. Under these circumstances, volumes for a given diameter class can be computed from the complete regression equations, which include a measurement of form.

Volume determinations of this nature find their greatest application in multiple-product sales or inventories, which consider the entire tree rather than a specific product. Careful measurements and estimates, and adherence to merchantable standards as herein described, should result in more reliable estimates of volume and growth.

Table 1.--Slash pine volume table--cubic feet [1]

D.b.h.[2] (inches)	Total height--feet												
	35	40	45	50	55	60	65	70	75	80	85	90	95
5.0	1.5	1.9	2.2	2.6	2.9	3.3	3.7	4.0					
5.5	2.0	2.5	2.9	3.3	3.8	4.2	4.6	5.1					
6.0	2.6	3.1	3.6	4.2	4.7	5.2	5.7	6.2					
6.5	3.2	3.8	4.4	5.1	5.7	6.3	6.9	7.5	8.1				
7.0	3.9	4.6	5.3	6.0	6.7	7.4	8.1	8.8	9.5				
7.5	4.6	5.4	6.2	7.0	7.8	8.7	9.5	10.3	11.1	11.9			
8.0	5.4	6.3	7.2	8.2	9.1	10.0	10.9	11.8	12.7	13.6			
8.5	6.2	7.3	8.3	9.3	10.4	11.4	12.4	13.5	14.5	15.5	16.5		
9.0	7.1	8.3	9.4	10.6	11.7	12.9	14.0	15.2	16.4	17.5	18.7		
9.5		9.3	10.6	11.9	13.2	14.5	15.8	17.0	18.3	19.6	20.9		
10.0			11.9	13.3	14.7	16.1	17.6	19.0	20.4	21.8	23.3		
10.5			13.2	14.8	16.3	17.9	19.5	21.0	22.6	24.2	25.8		
11.0				16.3	18.0	19.7	21.5	23.2	24.9	26.6	28.4	30.1	
11.5				17.9	19.8	21.7	23.5	25.4	27.3	29.2	31.1	33.0	
12.0				19.6	21.6	23.8	25.7	27.8	29.8	32.0	33.9	36.0	38.0
12.5				21.3	23.5	25.8	28.0	30.2	32.5	34.7	36.9	39.1	41.2
13.0				23.6	25.8	28.0	30.2	32.4	34.6	36.7	38.9	41.1	43.3
13.5				25.3	27.7	30.1	32.4	34.8	37.1	39.5	41.9	44.2	46.6
14.0				27.1	29.7	32.2	34.7	37.3	39.8	42.3	44.9	47.4	50.0
14.5				29.0	31.7	34.4	37.1	39.8	42.6	45.3	48.0	50.7	53.5
15.0				30.9	33.8	36.7	39.6	42.5	45.4	48.3	51.3	54.2	57.1
15.5				32.8	36.0	39.1	42.2	45.3	48.4	51.5	54.6	57.7	60.8
16.0				34.9	38.2	41.5	44.8	48.1	51.5	54.8	58.1	61.4	64.7
16.5				37.0	40.5	44.0	47.6	51.1	54.6	58.1	61.7	65.2	68.7
17.0				39.2	42.9	46.6	50.4	54.1	57.9	61.6	65.4	69.1	72.8
17.5				41.4	45.4	49.3	53.3	57.3	61.2	65.2	69.2	73.1	77.1
18.0				43.7	47.9	52.1	56.3	60.5	64.7	68.9	73.1	77.3	81.5
18.5				46.0	50.5	54.9	59.3	63.8	68.2	72.6	77.1	81.5	85.9
19.0				48.5	53.2	57.8	62.5	67.2	71.9	76.5	81.2	85.9	90.6
19.5				51.0	55.9	60.8	65.7	70.7	75.6	80.5	85.4	90.4	95.3
20.0				53.5	58.7	63.9	69.1	74.2	79.4	84.6	89.8	95.0	100.1

[1] To a 4-inch top, outside bark.
[2] Volume for d.b.h. classes up to 12.5 inches were computed from the pulpwood regression equation; volumes for d.b.h. classes 13.0 inches and above were computed from saw-log regression equations.

Table 2.--Longleaf pine volume table--cubic feet [1]

D.b.h.[2] (inches)	Total height--feet												
	35	40	45	50	55	60	65	70	75	80	85	90	95
5.0	1.6	1.9	2.3	2.6	3.0	3.3	3.7	4.1					
5.5	2.1	2.5	3.0	3.4	3.8	4.3	4.7	5.1					
6.0	2.7	3.2	3.7	4.2	4.7	5.2	5.8	6.3					
6.5	3.3	3.9	4.5	5.1	5.7	6.3	6.9	7.5	8.1				
7.0	4.0	4.7	5.4	6.1	6.8	7.5	8.2	8.9	9.6				
7.5	4.7	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.0			
8.0	5.5	6.4	7.3	8.2	9.1	10.1	11.0	11.9	12.8	13.7			
8.5	6.3	7.3	8.4	9.4	10.4	11.5	12.5	13.6	14.6	15.6	16.7		
9.0	7.2	8.3	9.5	10.7	11.8	13.0	14.2	15.3	16.5	17.6	18.8		
9.5		9.4	10.7	12.0	13.3	14.6	15.9	17.2	18.5	19.8	21.1		
10.0			12.0	13.4	14.8	16.3	17.7	19.1	20.6	22.0	23.4		
10.5			13.3	14.9	16.4	18.0	19.6	21.2	22.8	24.4	25.9		
11.0				16.4	18.1	19.9	21.6	23.3	25.1	26.8	28.6	30.3	
11.5				18.0	19.9	21.8	23.7	25.6	27.5	29.4	31.3	33.2	
12.0				19.7	21.8	23.8	25.9	28.0	30.0	32.1	34.1	36.2	38.2
12.5				21.5	23.7	26.0	28.2	30.4	32.7	34.9	37.2	39.4	41.5
13.0				23.1	25.3	27.6	29.8	32.0	34.3	36.5	38.8	41.0	43.2
13.5				24.8	27.3	29.7	32.1	34.5	36.9	39.3	41.8	44.2	46.6
14.0				26.7	29.3	31.9	34.5	37.1	39.7	42.3	44.8	47.4	50.0
14.5				28.6	31.3	34.1	36.9	39.7	42.5	45.3	48.1	50.8	53.6
15.0				30.5	33.5	36.5	39.5	42.4	45.4	48.4	51.4	54.4	57.3
15.5				32.5	35.7	38.9	42.1	45.3	48.5	51.6	54.8	58.0	61.2
16.0				34.6	38.0	41.4	44.8	48.2	51.6	55.0	58.4	61.8	65.1
16.5				36.8	40.4	44.0	47.6	51.2	54.8	58.4	62.0	65.6	69.2
17.0				39.0	42.8	46.7	50.5	54.3	58.1	62.0	65.8	69.6	73.5
17.5				41.3	45.3	49.4	53.5	57.5	61.6	65.6	69.7	73.7	77.8
18.0				43.6	47.9	52.2	56.5	60.8	65.1	69.4	73.7	78.0	82.3
18.5				46.0	50.6	55.1	59.7	64.2	68.7	73.3	77.8	82.3	86.9
19.0				48.5	53.3	58.1	62.9	67.7	72.4	77.2	82.0	86.8	91.6
19.5				51.1	56.1	61.2	66.2	71.2	76.3	81.3	86.4	91.4	96.4
20.0				53.7	59.0	64.3	69.6	74.9	80.2	85.5	90.8	96.1	101.4

[1] To a 4-inch top, outside bark
[2] Volume for d.b.h. classes up to 12.5 inches were computed from the pulpwood regression equation; volumes for d.b.h. classes 13.0 inches and above were computed from saw-log regression equations.

Table 3.--<u>Slash and longleaf pine pulpwood volume table--cubic feet</u>[1]

D.b.h. (inches)	Total height-- feet											
	35	40	45	50	55	60	65	70	75	80	85	90
5.0	1.5	1.9	2.2	2.6	2.9	3.3	3.7	4.0				
5.5	2.0	2.5	2.9	3.3	3.8	4.2	4.6	5.1				
6.0	2.6	3.1	3.6	4.2	4.7	5.2	5.7	6.2				
6.5	3.2	3.8	4.4	5.1	5.7	6.3	6.9	7.5	8.1			
7.0	3.9	4.6	5.3	6.0	6.7	7.4	8.1	8.8	9.5			
7.5	4.6	5.4	6.2	7.0	7.8	8.7	9.5	10.3	11.1	11.9		
8.0	5.4	6.3	7.2	8.2	9.1	10.0	10.9	11.8	12.7	13.6		
8.5	6.2	7.3	8.3	9.3	10.4	11.4	12.4	13.5	14.5	15.5	16.6	
9.0	7.1	8.3	9.4	10.6	11.7	12.9	14.1	15.2	16.4	17.5	18.7	
9.5		9.3	10.6	11.9	13.2	14.5	15.8	17.1	18.4	19.7	21.0	
10.0			11.9	13.3	14.7	16.2	17.6	19.0	20.5	21.9	23.3	
10.5			13.2	14.8	16.4	17.9	19.5	21.1	22.7	24.3	25.8	
11.0				16.3	18.0	19.8	21.5	23.2	25.0	26.7	28.5	30.2
11.5				17.9	19.8	21.7	23.6	25.5	27.4	29.3	31.2	33.1
12.0				19.6	21.7	23.8	25.8	27.9	29.9	32.0	34.1	36.1
12.5				21.4	23.6	25.9	28.1	30.3	32.6	34.8	37.0	39.3

[1] To a 4.0-inch top, outside bark.

Table 4.--<u>Slash pine sawtimber volume table--board-feet (Scribner)</u> [1]

D.b.h. (inches)	Total height-- feet										
	45	50	55	60	65	70	75	80	85	90	95
9.0		9	14	20	25	31	36	42	47	52	58
9.5		15	21	27	33	39	45	52	58	64	70
10.0	15	22	28	35	42	49	55	62	69	75	82
10.5	21	29	36	43	51	58	66	73	80	88	95
11.0	28	36	44	52	60	68	76	85	93	101	109
11.5	35	43	52	61	70	79	88	97	106	114	123
12.0	42	51	61	71	80	90	100	109	119	129	138
12.5	49	60	70	81	91	101	112	122	133	143	154
13.0	57	68	79	91	102	113	125	136	148	159	170
13.5	65	77	89	101	114	126	138	150	163	175	187
14.0	73	86	99	113	126	139	152	165	178	192	205
14.5	82	96	110	124	138	152	166	180	195	209	223
15.0	91	106	121	136	151	166	181	196	211	227	242
15.5	100	116	132	148	164	180	197	213	229	245	261
16.0	109	127	144	161	178	195	212	230	247	264	281
16.5	119	137	156	174	192	211	229	247	265	284	302
17.0	129	149	168	187	207	226	246	265	285	304	323
17.5	140	160	181	201	222	242	263	284	304	325	345
18.0	150	172	194	216	237	259	281	303	324	346	368
18.5	161	184	207	230	253	276	299	322	345	368	391
19.0	173	197	221	245	270	294	318	342	367	391	415
19.5	184	210	235	261	287	312	338	363	389	414	440
20.0	196	223	250	277	304	331	357	384	411	438	465

[1] To an 8-inch top, outside bark

Table 5.--Slash pine sawtimber volume table--board-feet (Int. $\frac{1}{4}$-inch) [1]

| D.b.h. (inches) | Total height-- feet |
	45	50	55	60	65	70	75	80	85	90	95
9.0				12	19	25	31	37	43	49	55
9.5			14	21	27	34	41	48	54	61	68
10.0		15	22	29	37	44	52	59	67	74	82
10.5	14	22	30	39	47	55	63	72	80	88	96
11.0	21	30	39	48	57	66	75	85	94	103	112
11.5	29	39	49	58	68	78	88	98	108	118	128
12.0	37	47	58	70	80	90	101	112	123	134	144
12.5	45	57	68	80	92	103	115	127	138	150	162
13.0	53	66	79	91	104	117	129	142	155	167	180
13.5	62	76	90	103	117	131	144	158	171	185	199
14.0	72	86	101	116	130	145	160	174	189	204	218
14.5	81	97	113	128	144	160	176	191	207	223	238
15.0	91	108	125	142	158	175	192	209	226	243	259
15.5	101	119	137	155	173	191	209	227	245	263	281
16.0	112	131	150	170	189	208	227	246	265	284	303
16.5	123	143	164	184	204	225	245	265	286	306	326
17.0	134	156	177	199	221	242	264	285	307	329	350
17.5	146	169	192	215	237	260	283	306	329	352	375
18.0	158	182	206	230	255	279	303	327	352	376	400
18.5	170	196	221	247	272	298	324	349	375	400	426
19.0	183	210	237	264	291	318	345	372	399	426	453
19.5	196	224	252	281	309	338	366	395	423	451	430
20.0	209	239	269	298	328	358	388	418	448	478	508

1/ To an 8-inch top, outside bark.

Table 6.--Longleaf pine sawtimber volume table--board-feet (Scribner) [1]

| D.b.h. (inches) | Total height-- feet |
	45	50	55	60	65	70	75	80	85	90	95
9.0			18	24	30	36	42	48	54	60	66
9.5		19	26	32	39	46	52	59	66	72	79
10.0	19	26	34	41	48	56	63	71	78	85	93
10.5	26	34	42	50	58	66	75	83	91	99	107
11.0	33	42	51	60	69	78	87	96	105	114	123
11.5	40	50	60	70	80	89	99	109	119	129	138
12.0	48	59	69	80	91	102	112	123	134	144	155
12.5	56	68	79	91	103	114	125	137	149	161	172
13.0	65	77	90	102	115	128	140	153	165	178	190
13.5	74	87	101	114	128	141	155	168	182	195	209
14.0	83	97	112	126	141	156	170	185	199	214	228
14.5	92	108	124	139	155	170	186	202	217	233	248
15.0	102	119	136	152	169	186	202	219	236	253	269
15.5	112	130	148	166	184	202	219	237	255	273	291
16.0	123	142	161	180	199	218	237	256	275	294	313
16.5	134	154	174	194	215	235	255	275	295	316	336
17.0	145	166	188	209	231	252	274	295	317	338	360
17.5	156	179	202	225	247	270	293	316	338	361	384
18.0	168	192	216	240	265	289	313	337	361	385	409
18.5	181	206	231	257	282	308	333	358	384	409	435
19.0	193	220	247	273	300	327	354	381	407	434	461
19.5	206	234	262	291	319	347	375	404	432	460	488
20.0	219	249	278	308	338	368	397	427	457	486	516

1/ To an 8-inch top, outside bark.

Table 7.--Longleaf pine sawtimber volume table--board-feet (Int. ¼-inch)[1]

D.b.h. (inches)	45	50	55	60	65	70	75	80	85	90	95
					Total height-- feet						
9.0				17	23	30	37	44	50	57	64
9.5			18	26	33	41	48	56	63	71	78
10.0		19	27	36	44	52	61	69	77	85	94
10.5	18	28	37	46	55	64	73	82	92	101	110
11.0	26	36	46	57	67	77	87	97	107	117	127
11.5	35	46	57	68	79	90	101	112	123	134	145
12.0	44	56	68	79	91	103	115	127	139	151	163
12.5	53	66	79	92	105	118	131	144	156	169	182
13.0	62	76	90	104	118	132	146	160	174	188	203
13.5	72	87	102	118	133	148	163	178	193	208	223
14.0	82	99	115	131	148	164	180	196	213	229	245
14.5	93	111	128	145	163	180	198	215	233	250	268
15.0	104	123	141	160	179	197	216	235	253	272	291
15.5	115	135	155	175	195	215	235	255	275	295	315
16.0	127	149	170	191	212	233	255	276	297	318	340
16.5	139	162	185	207	230	252	275	298	320	343	365
17.0	152	176	200	224	248	272	296	320	344	368	392
17.5	165	190	216	241	266	292	317	343	368	394	419
18.0	178	205	232	259	286	313	339	366	393	420	447
18.5	192	220	248	277	305	334	362	391	419	447	476
19.0	206	236	266	296	326	356	385	415	445	475	505
19.5	220	252	283	315	346	378	409	441	473	504	536
20.0	235	268	301	334	368	401	434	467	500	534	567

1/ To an 8-inch top, outside bark.

Table 8.--Slash pine topwood volumes [1]

D.b.h. (inches)	50	55	60	65	70	75	80	85
				Total height-- feet				
	- - - - - Cubic feet - - - - -							
10	6.4	7.1	7.7	8.4	9.0	9.7	10.3	11.0
12	4.4	4.9	5.3	5.8	6.2	6.7	7.1	7.6
14	3.2	3.5	3.9	4.2	4.5	4.9	5.2	5.5
16	2.4	2.7	2.9	3.2	3.4	3.7	4.0	4.2
18	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3
	- - - - - Cords[2] - - - - -							
10	.071	.079	.086	.093	.100	.108	.114	.122
12	.049	.054	.059	.064	.069	.074	.079	.084
14	.036	.039	.043	.047	.050	.054	.058	.061
16	.027	.030	.032	.036	.038	.041	.044	.047
18	.021	.023	.026	.028	.030	.032	.034	.037

1/ That portion of the volume of a sawtimber tree between an 8-inch and a 4-inch d.o.b. point.

2/ To convert cubic-foot volume to cords, a ratio of 90 cubic feet of solid wood to a standard cord of 128 cubic feet was employed.

<p style="text-align:center">Table 9.--<u>Longleaf pine topwood volumes</u> [1]</p>

D.b.h. (inches)	Total height-- feet							
	50	55	60	65	70	75	80	85
	- - - - - Cubic feet - - - - -							
10	5.8	6.3	6.9	7.4	8.0	8.5	9.1	9.6
12	4.1	4.5	4.8	5.2	5.6	6.0	6.4	6.8
14	3.1	3.3	3.6	3.9	4.1	4.5	4.7	5.0
16	2.4	2.6	2.8	3.0	3.3	3.5	3.7	3.9
	- - - - - Cords [2] - - - - -							
10	.064	.070	.077	.082	.089	.094	.101	.107
12	.045	.050	.053	.058	.062	.067	.071	.075
14	.034	.037	.040	.043	.045	.050	.052	.055
16	.027	.029	.031	.033	.037	.039	.041	.043

[1] That portion of the volume of a sawtimber tree between an 8-inch and a 4-inch d.o.b. point.

[2] To convert cubic-foot volume to cords, a ratio of 90 cubic feet of solid wood to a standard cord of 128 cubic feet was employed.

<p style="text-align:center">Table 10.--<u>Slash-longleaf pine topwood volumes</u> [1]</p>

D.b.h. (inches)	Total height-- feet							
	50	55	60	65	70	75	80	85
	- - - - Cubic feet - - - -							
10	6.1	6.7	7.3	7.8	8.4	9.0	9.6	10.2
12	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.1
14	3.2	3.5	3.8	4.1	4.4	4.7	5.0	5.3
16	2.5	2.8	3.0	3.2	3.4	3.7	3.9	4.1
18	2.1	2.2	2.4	2.6	2.8	3.0	3.1	3.3
	- - - - Cords [2] - - - -							
10	.067	.074	.081	.087	.093	.100	.107	.113
12	.048	.052	.057	.061	.065	.070	.074	.079
14	.036	.039	.042	.045	.049	.052	.055	.059
16	.028	.031	.033	.036	.038	.041	.043	.045
18	.023	.024	.027	.029	.031	.033	.034	.037

[1] That portion of the volume of a sawtimber tree between an 8-inch and a 4-inch d.o.b. point.

[2] To convert cubic-foot volume to cords, a ratio of 90 cubic feet of solid wood to a standard cord of 128 cubic feet was employed.

Table 11.--Estimates of topwood per MBM (Scribner)
by average stand diameters 1/

Average stand d.b.h. (inches)	Slash	Longleaf
- - - Cords - - -		
11	1.1	.8
12	.9	.7
13	.6	.5
14	.4	.3
15	.2	.1

1/ Based on timber sales on the Olustee Experimental
Forest using local sawtimber and topwood regression
equations.